

Patent claims

1. Device for digital pulse width modulation with:

5 (a) a filter device (11) for filtering a filter input signal (10'');

(b) a quantization device (13) for quantizing a filter output signal (11') of the filter device
10 (11);

(c) a PWM mapper device (15) for generating a digital PWM signal (15') from an output signal (13') of the quantization device (13); and
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(d) a feedback loop (17) for feeding back the digital PWM signal (15') to a loop input signal (10') and for generating the filter input signal (10'') by subtraction.
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2. Device according to Claim 1, characterized in that an interpolation device (10), in particular an interpolation filter, is provided for generating the loop input signal (10') from an input signal (1).
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3. Device according to Claim 1 or 2, characterized in that a post-filter device (16) is provided for filtering the PWM signal (50').

30 4. Device according to one of the preceding claims, characterized in that a different sampling rate (12) is provided at the filter device (11) than the sampling rate (14) of the quantization device (13).

35 5. Device according to one of the preceding claims, characterized in that a pulse frequency of the PWM

5 signal (15') corresponds to the sampling frequency (14) of the quantization device (13) and is smaller by a factor of 2^N than the sampling frequency (12) of the filter device (11), N corresponding to the number of bits of the quantization device (13).

10 6. Device according to one of the preceding claims, characterized in that the PWM signal (15') has a constant pulse frequency.

15 7. Device according to one of the preceding claims, characterized in that amplitude values of the output signal (13') of the quantization device (13) can be converted into pulse widths of the PWM signal (15') in the PWM mapper device (15).

20 8. Device according to one of the preceding claims, characterized in that two at least similar feedback loops (17, 17', 11, 13, 15) which are connected to each other on the output side via a load (18) are provided, loop input signals (10', -10') that are inverse in relation to each other being provided on the two loops (17, 17', 11, 13, 15) for generating a differential PWM signal at the load (18).

25 9. Device according to one of the preceding claims, characterized in that a loop filter of the 4th order with a resolution of the quantization device (13) of 4 bits is provided as the filter device (11).

30 10. Device according to one of the preceding claims, characterized in that, for stabilization in the case of overloading, limiting devices (20) are provided in the filter device (11) for limiting output values of integrators (I).

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11. Device for digital pulse width modulation with:

- 5 (a) a filter device (19) for filtering a filter input signal (10'') in a first feedback loop (21);
- (b) a quantization device (13) for quantizing a loop signal (21');
- 10 (c) a PWM mapper device (15) for generating a digital PWM signal (15') from an output signal (13') of the quantization device (13); and
- 15 (d) a second feedback loop (22) for feeding back the digital PWM signal (15') to a loop signal (21') while generating the filter input signal (10'') by subtraction,
- 20 it being possible for the loop signal (21') to be generated from a loop input signal (10') and a filter output signal (11') by addition.

12. Device according to one of the preceding claims, characterized in that an amplifier device and/or
- 25 filter device is provided downstream of the PWM mapper for amplification and/or filtering of the digital PWM signal and is connected to a voltage supply which is likewise connected to an A/D converter, the output signal of which is connected
- 30 to a multiplier in the control loop.

13. Method for digital pulse width modulation with the steps of:

- 35 (a) filtering a filter input signal (10'') in a filter device (11);

- (b) quantizing a filter output signal (11') of the filter device (11) in a quantization device (13);
- 5 (c) generating a digital PWM signal (15') from the output signal (13') of the quantization device (13) in a PWM mapper device (15); and
- 10 (d) feeding back the digital PWM signal (15') to a loop input signal (10') and generating the filter input signal (10'') in a feedback loop (17).
- 15 14. Method according to Claim 13, characterized in that a bandpass pulse width modulation is performed.
- 20 15. Method according to Claim 13 or 14, characterized in that an amplifier device and/or filter device is provided downstream of the PWM mapper (15) for amplification and/or filtering of the digital PWM signal (15') and is connected to a voltage supply (25) which is likewise connected to an A/D converter (26), the output signal (27) of which is connected
- 25 to a multiplier in the control loop (17; 22), the operating voltage signal (25) being digitized in the A/D converter (26) and coupled into the control loop (17, 17', 22).